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FARMERS' BULLETIN 1042
UNITED STATES DEPARTMENT OF AGRICULTURE



SAVING **MAN LABOR** *in* **SUGAR BEET FIELDS**



BY USING BIGGER IMPLEMENTS and more horses per man, many sugar-beet growers have greatly reduced their expenses for man labor and often at the same time have been able to cover more ground per day than before. This bulletin tells how the more successful farmers of the several American sugar-beet regions are speeding up production and saving man power by thus increasing their efficiency in the utilization of larger teams and improved mechanical power.

Office of the Secretary
Contribution from the Office of Farm Management
E. H. THOMSON, Acting Chief
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SAVING MAN LABOR IN SUGAR-BEET FIELDS.

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FACTORS IN SAVING LABOR.

THE MEANS of reducing the man labor necessary in the production of sugar beets lie mainly in the use of more horses, the adoption of larger implements, the perfecting of mechanical lifters, and the substituting, whenever practicable, of tractors for horses. While an increase in the number of horses used per crew generally implies a reduction in the man-labor requirements for a given operation, it adds to the number of horse hours that will be required for a specified amount of work. The combination of certain horse units permits the operator to get along with fewer men, without delaying the field work, and under certain conditions to complete it in much less time.

The normal man-labor requirement in growing sugar beets will vary from 80 to 135 hours or more per acre. Under average conditions the man labor that is used in connection with machine operations will approximate 25 per cent of these totals, the remainder being utilized in doing the hand labor, such as blocking, thinning, hoeing, pulling, topping, and loading. It would appear therefore that a careful analysis of the latter operations might afford an opportunity to reduce the labor requirements of this crop quite appreciably. Two phases of the field work will be discussed for the purpose of bringing out any advantages that might accrue by a modification of present methods of culture.

There is considerable variation in the crew sizes which are employed in districts where sugar beets are grown extensively. There is also a difference in the amount of work done by these crews. Generally speaking, the crews are much larger in the irrigated districts of Colorado, Idaho, and Utah than in Michigan and Ohio. The California beet-growing districts have developed production on the largest scale and very large crews are common there. In most instances the purchase of an extra horse, merely for this work, could



FIG. 1.—Plowing under clover and timothy sod with a single-furrow walking plow, using a crew of one man and two horses. Compare with figure 2.

not be recommended. Too often, however, a horse is standing idle in the barn when he ought to be at work, or, if there is no extra horse on the farm, possibly a larger horse crew can be made up by hiring one or more from a neighbor.

PLOWING PRACTICE.

A direct comparison of plowing crews can not be made unless the conditions under which the work is done are uniform in every respect. Soils vary in texture, and some farmers habitually plow deeper than



FIG. 2.—Plowing alfalfa under with a two-way plow which eliminates dead furrows and back furrows. The crew consists of one man and four horses. Compare with figure 1.

others. Some general deductions can, however, be made in an analysis of the work done by different sized crews in prescribed regions.

In Michigan and Ohio, two types of crews predominate, namely, one man and two horses, and one man and three horses. These



FIG. 3.—A single-furrow sulky plow with a crew of one man and six mules. This will accomplish only one-third as much work as the outfit shown in figure 4.

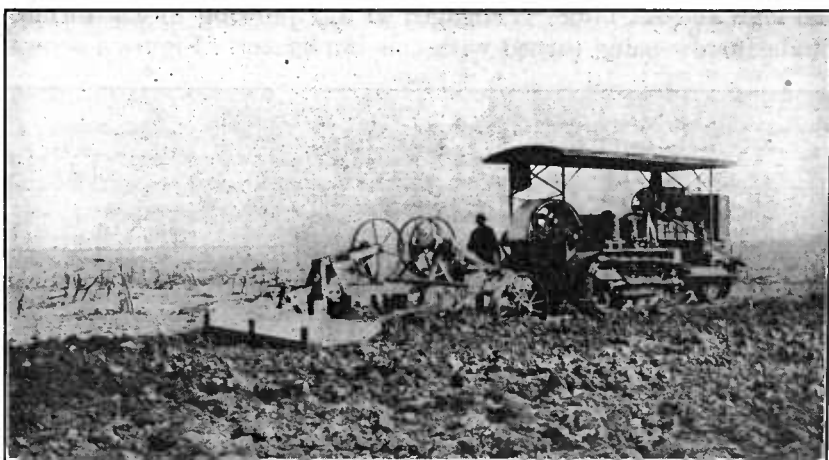


FIG. 4.—A gasoline tractor with three plows and a float attached. Two men are required to run this outfit. In addition to saving time and man labor over the outfit shown in figure 1, it also has the advantage of pulverizing the soil by means of the planker or float.

are about equally divided. There is approximately one hour per acre less in the amount of man labor necessary to operate the plow which is drawn by three horses; however, slightly more horse labor is required. It is evident, therefore, that the larger crew has the advantage in doing the plowing on any farm.

Only a comparatively small number of operators use a crew consisting of one man and four horses (fig. 2). In this group the man labor consumes one-half the time reported for a crew consisting



FIG. 5.—Disking with a crew of one man and two horses. This outfit takes as much man labor as one with additional horses. Compare with figure 6.

of one man and two horses. In the case of figure 3, a crew of one man and six mules is engaged in dry plowing in California, a single furrow being turned with this implement. Figure 4 shows a



FIG. 6.—Disking with a crew of one man and four horses. About a quarter of an hour of man labor per acre is saved with this outfit over that shown in figure 5.

gasoline tractor operating a plow which is turning three furrows. A float or planker is attached to the plow, hence the cloddy surface is being pulverized with little additional effort or cost. Two men are required to handle this outfit. It is obvious that the 6-horse crew

requires one man per furrow, while two men with the tractor outfit handle three furrows and do some clod mashing besides, thus saving both in man and horse labor.



FIG. 7.—A two-section spike-tooth harrow in use with a crew of one man and three horses. This outfit is handled a little more easily than the one in figure 8, but has only half the power, while covering two-thirds the surface. Not so rapid work would be possible.

DISKING PRACTICE.

Disking is a minor operation in most sugar-beet regions. The largest number of records for this operation came from the Michigan



FIG. 8.—Six horses abreast pulling a three-section spike-tooth harrow. This covers 50 per cent more surface, and does it more easily because there is twice as much power as in figure 7.

and Ohio districts. Three principal crew sizes are used in this region. Some of the disking is done with a crew of one man and two horses, on other farms the operator uses a crew of one man and three horses, and still other growers do the disking with a crew of

one man and four horses. The 4-horse outfit saves a quarter of an hour of man labor per acre over the 2-horse equipment. This may seem to be a small saving, but in a day's work it amounts to hours.

SPIKE-TOOTH HARROWING.

Harrowing with the spike tooth is reported for a majority of the farms studied. The prevailing crew in Michigan and Ohio includes one man and two horses, in the Colorado beet districts one man and four horses, and in Utah and Idaho one man and three horses. California operators generally utilize one of two crew sizes, one man and four horses, or one man and six horses. There is con-

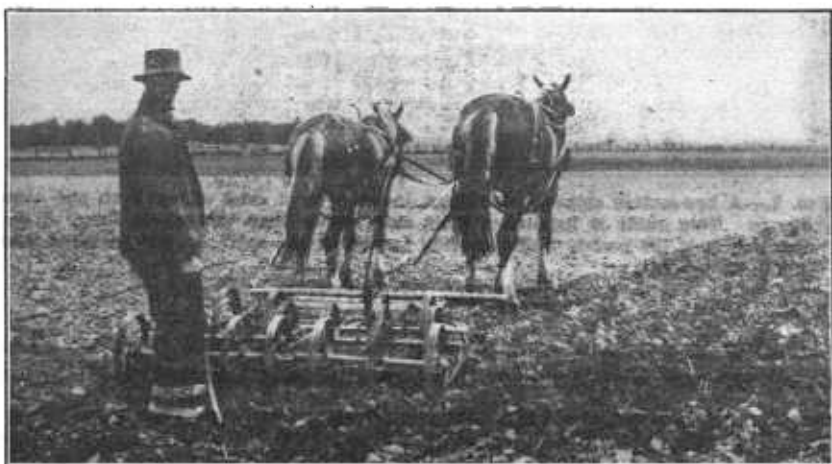


FIG. 9.—A two-section spring-tooth harrow with a crew of one man and two horses. They will cover only 6 to 8 acres per day, and the horses will work harder than those in figure 10.

siderable variation in the number of times the land is harrowed in the different districts. A comparison of the work done by a crew of one man and two horses with that done by one man and four horses shows an appreciable saving in the man-labor requirement in favor of the larger crew. As a rule an increase in the number of horses from two to three does not result in changing the size of the implement, but it gives the operator an opportunity to go over the land a little more rapidly.

SPRING-TOOTH HARROWING.

The spring-tooth harrow is used generally in the preparation of land throughout the Michigan and Ohio districts. It is not so common in other regions, although a few men reported on this implement. The crew sizes, therefore, have been selected entirely from the Michigan and Ohio records. The crew of one man and four

horses has a decided advantage over the 1-man and 2-horse outfit, from the standpoint of man labor. The latter operating a two-section spring-tooth harrow will probably cover from 6 to 8 acres, whereas a crew of one man and four horses, using a 3-section spring-tooth harrow, will average from 10 to 12 acres per day.

At the time these records were assembled very little information was available concerning the work that could be accomplished with a tractor, particularly in connection with the spring-tooth harrow. It appeared to be the general opinion that the small to moderate-sized gasoline tractor was exceedingly valuable in that it enabled the farmer to meet and handle the peak load of labor during two or three critical periods of the year.

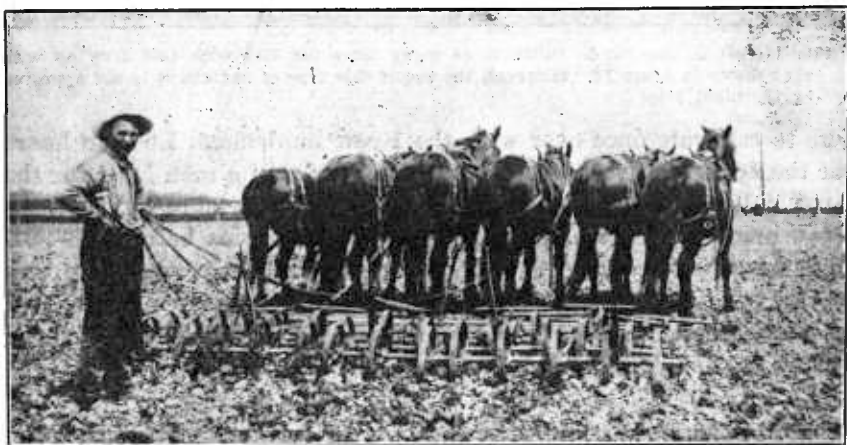


FIG. 10.—A five-section spring-tooth harrow drawn by six horses. This outfit covers more than double the surface of the one in figure 9, and has three times the power, so works more easily.

CULTIVATING.

The cultivation of sugar beets furnishes striking contrasts in crew efficiency. In the Utah and Idaho areas some farmers use a crew of one man and one horse (fig. 11), with an implement large enough for two rows, whereas others use one man and two horses (fig. 14) and an implement covering four rows at a time. It is very evident that a considerable saving can be effected by using the 4-row cultivator. It may not be possible for every operator to own a 4-row cultivator, but in many cases such an implement might be owned cooperatively and serve several farmers.

In Michigan and Ohio three types of cultivators were found, including 1- and 2-row machines operated by a crew of one man and two horses and 1-, 2-, and 4-row implements operated by a 1-man, 2-horse crew. One grower reported the use of a 2-row, 1-horse walking cultivator (fig. 11). In the latter group it required 1.9 man hours per



FIG. 11.—It is possible to cultivate as many acres per day with this crew as with that shown in figure 12. However, the use of this type of implement is not approved by the hired help.

acre to cultivate once over with the 1-row implement, 1.6 man hours for the 2-row cultivator (fig. 12), and only 0.9 of a man hour for the 4-row cultivator (fig. 14), a distinct saving in man labor by using the 4-row machine. Again, many fields require attention before it is possible for the grower to get the work accomplished; therefore any saving in labor and time is an advantage to the growing crop and affords more man labor for such crops as compete with the sugar beet in the distribution of labor.



FIG. 12.—Cultivating two rows with crew of one man and one horse. This type of outfit is easier on the man than is the walking cultivator, but has only half the power of the one shown in figure 14 and covers only half the surface at each round—a clear loss of 50 per cent of man power.

LIFTING.

Under humid conditions, which prevail in the Michigan and Ohio beet-producing districts, a large percentage of the farm operators reporting do the lifting with a crew of one man and two horses. A



FIG. 13.—This implement cultivates two beet rows and consumes less man labor per acre than the outfit shown in figure 11, and with less inconvenience to the driver.



FIG. 14.—A typical four-row cultivator operated by one man and two horses. This implement has double the power of the one shown in figure 12 and covers twice the ground.

comparatively small group in the same area performs this operation with a crew of one man and three horses. There was not a very great difference in the man-labor requirement in these two groups



FIG. 15.—Lifting sugar beets with a one-row implement. With this implement one man and two horses can lift about $1\frac{1}{2}$ acres of beets per day.

However, where the acreage is large there is a considerable saving of man labor during the harvest season.

In Utah and Idaho the lifting is done entirely with crews of one man and two horses and one man and three horses. With one man and two horses it required about 6 man hours, under average con-



FIG. 16.—By adding one horse to the outfit shown in figure 15, more than an hour of man labor per acre can be saved, and the work is easier on the horses.

ditions, to lift an acre of beets (fig. 15), whereas with the 1-man and 3-horse crew (fig. 16), the average time consumed in lifting an acre was slightly less than five hours. In the Colorado area three sizes of crew were found, the first two being the same as in Utah and

Michigan, the third 1 man and 4 horses. The latter was the most efficient crew from the standpoint of economy in the use of man labor.

In California the crews varied in size from 1 man and 3 horses up to 1 man and 10 horses. There was a fairly uniform reduction of man-labor requirement from the smallest to the largest, with a corresponding increase in the horse-labor requirement as the number of horses increased.

Under average conditions, a crew of 1 man and 2 horses, working continuously, will lift approximately $1\frac{1}{2}$ acres of beets per day. A crew of 1 man and 4 horses will probably increase this area to 2 acres or possibly $2\frac{1}{2}$ acres per day under favorable conditions (fig. 17). The performance of this implement can be improved still further with the addition of more horsepower. It is a common prac-



FIG. 17.—A one-row lifter operated with four horses. This outfit will cover 2 to $2\frac{1}{2}$ acres per day under favorable conditions, nearly doubling the acreage of the lifter shown in figure 15, with the same man power.

tice in some sugar-beet sections, either to hire the lifting or a part of the hauling done. If by using an extra horse on the lifter this work can be performed in a shorter period, more time will be available for hauling the beets to the factory or loading station.

MECHANICAL LIFTERS AND TOPPERS.

An appreciable saving in farm labor will undoubtedly be accomplished through the development of mechanical harvesters. Some progress has been made in this direction within recent years and several types of machines will be available for use in the near future. The hand labor on sugar beets, comprising such operations as blocking, thinning, hoeing, pulling, topping, and loading, constitutes from 52 to 75 per cent of the total man labor required in growing a crop of sugar beets. It will therefore be seen that there is an opportunity to effect economy in the use of labor by making a careful analysis of the above group of operations. The pulling, topping,

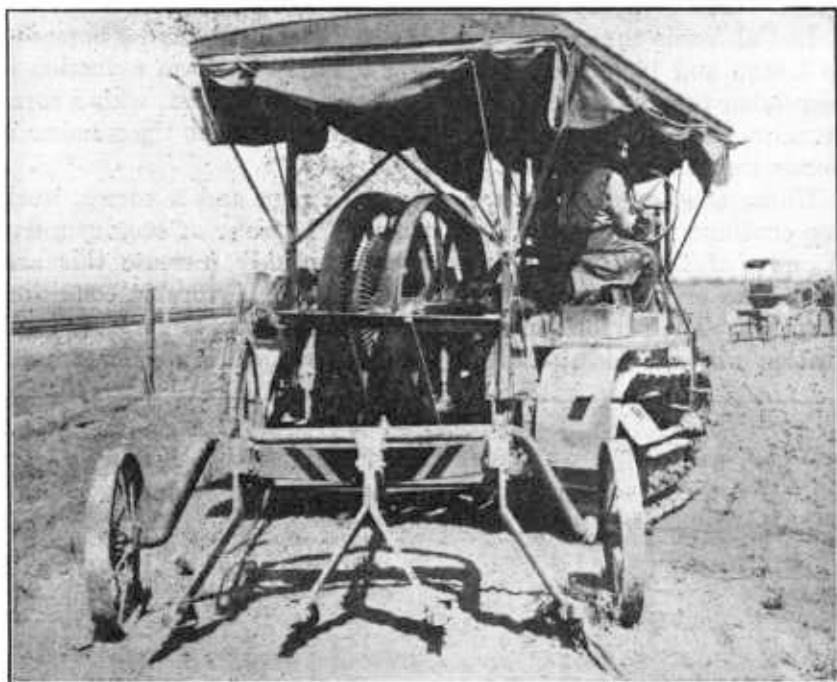


FIG. 18.—A tractor hauling a four-row beet-lifter. This outfit will cover 12 to 16 acres per day.

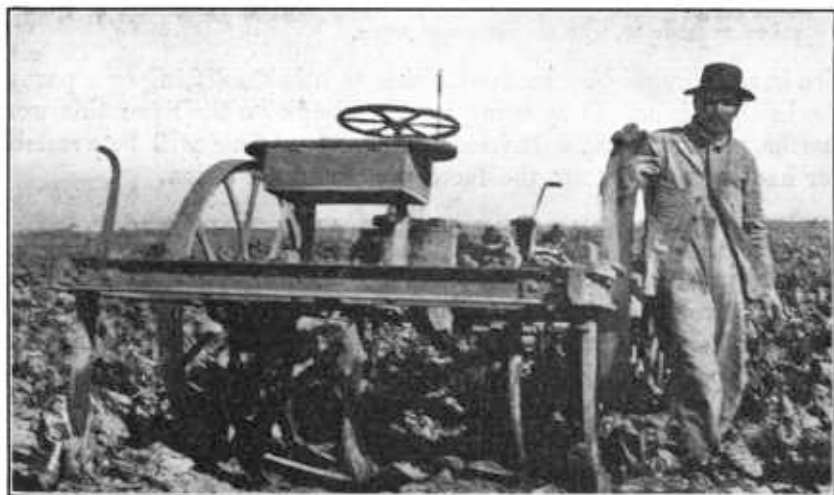


FIG. 19.—Type of steam-power lifter that is handled by use of a cable. With this lifter 30 to 40 acres can be covered.

and loading, when combined, make up 24 to 42 per cent of the work which is usually classified as contract labor. As a rule the cash payment for the pulling, topping, and loading is approximately equal to the expenditure for blocking, thinning, and hoeing, which



FIG. 20.—A mechanical lifter and topper (front view)

indicates that about the same amount of the time is consumed in performing the work involved in these two groups. Estimates made by several growers show that there is a variation of 24 to 30 hours in the labor requirement for the hand work in harvesting. It is very

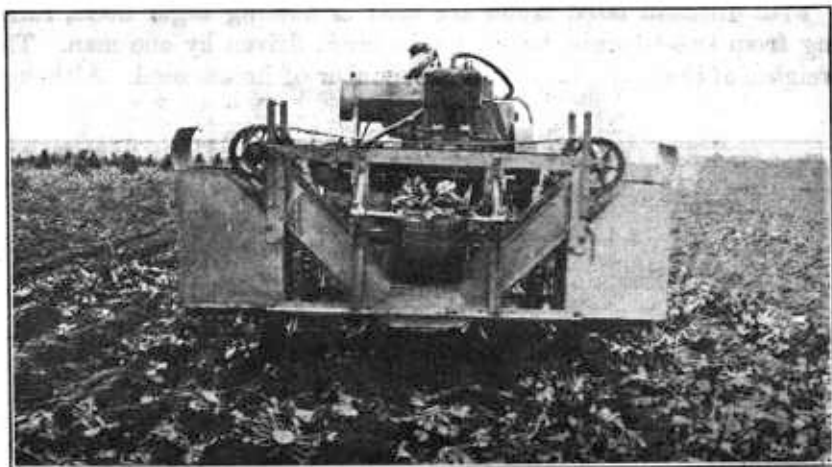


FIG. 21.—A mechanical lifter and topper (rear view).

apparent that this amount can be reduced to a few hours per acre with the introduction of the mechanical harvester. This will in turn release man labor for other important farm work during the fall months.



FIG. 22.—Hauling a small load of sugar beets to the loading station or dump, with a crew of one man and two horses. Hauling small loads is a waste of man power. It would take three times as long to haul a supply of beets to the factory with this equipment as it would with the outfit shown in figure 23.

HAULING SUGAR BEETS.

Two important factors must be considered in making a study of crew efficiency in marketing beets. In the first place, the size of the crew has an important bearing upon the quantity of material that can be delivered daily. In the second place, the distance the material has to be hauled must be taken into account.

Five different sized crews are used in hauling sugar beets, ranging from two to eight horses to the crew, driven by one man. The weights of the loads vary with the number of horses used. Although



FIG. 23.—The addition of a third horse to the two-horse team increases the hauling capacity 50 per cent, with the same man power as before.

there is considerable variation in the amount hauled by the same sized team in a given locality, approximately one ton of beets per horse was hauled.

Figure 22 shows a small load of sugar beets on the way to the beet dump; figure 23 a larger load drawn by three horses, while



FIG. 24.—Where four horses are available for hauling, twice the tonnage can be hauled as with two horses, and with no greater expenditure of man labor. Only one-half the man labor per ton is required. Six horses can haul from 5 to 6 tons per load, and one man does the work of three men with two-horse outfits.

figures 24 and 25 illustrate how man labor can be further conserved by using more horses. In sections where the sugar beets are unloaded by a mechanical beet dump, the roadway of the dump may not be wide enough to permit hitching three horses abreast. Under such conditions the third horse can be hitched ahead of the other two horses.



FIG. 25.—A crew of one man and eight horses taking two big loads of beets to the factory. In some localities this quantity would be divided into four small loads like the one shown in figure 22, requiring three additional men.

In California the harvesting is done on a very extensive basis. In figure 25 a crew of one man and eight horses is employed in hauling two loads of beets to the station or beet dump. The quantity of beets represented in these two loads (about 8 tons) would in some localities be divided into four loads, and three additional men would be required to drive the wagons.

By using more horses and hauling more beets to the load, thereby reducing the number of trips to the factory or loading station, not only is less labor required to do the work but the hauling is finished before the unfavorable fall weather sets in.

As has previously been indicated, it is not practicable for the Michigan, the Colorado, or the Utah farmer who has only four horses to

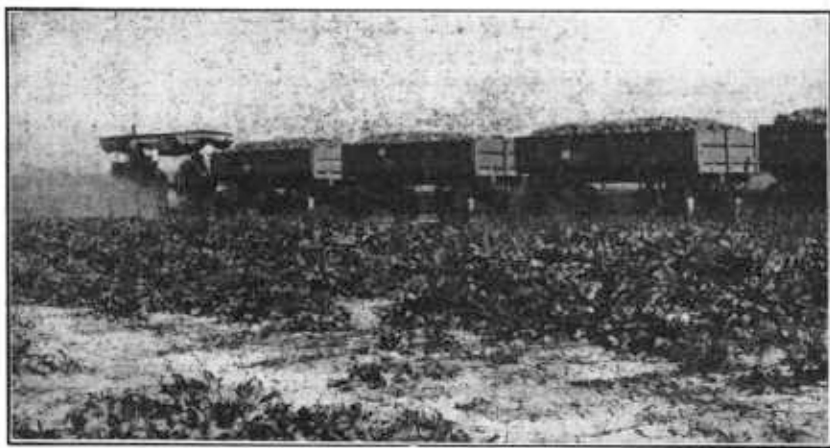


FIG. 26.—Hauling a train of four wagons with a gasoline tractor. This plan conserves a maximum amount of man power.

attempt to hire four more horses and haul as many beets as are shown in figure 25. Neither is it always feasible to add even two horses to the size of team used. However, where conditions are such that more horses are available, the more efficient use of horse power will contribute much toward the solution of the man-labor problem on farms where the sugar beet is grown.

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